Plate 1. To face the Title.

Fig. 1.

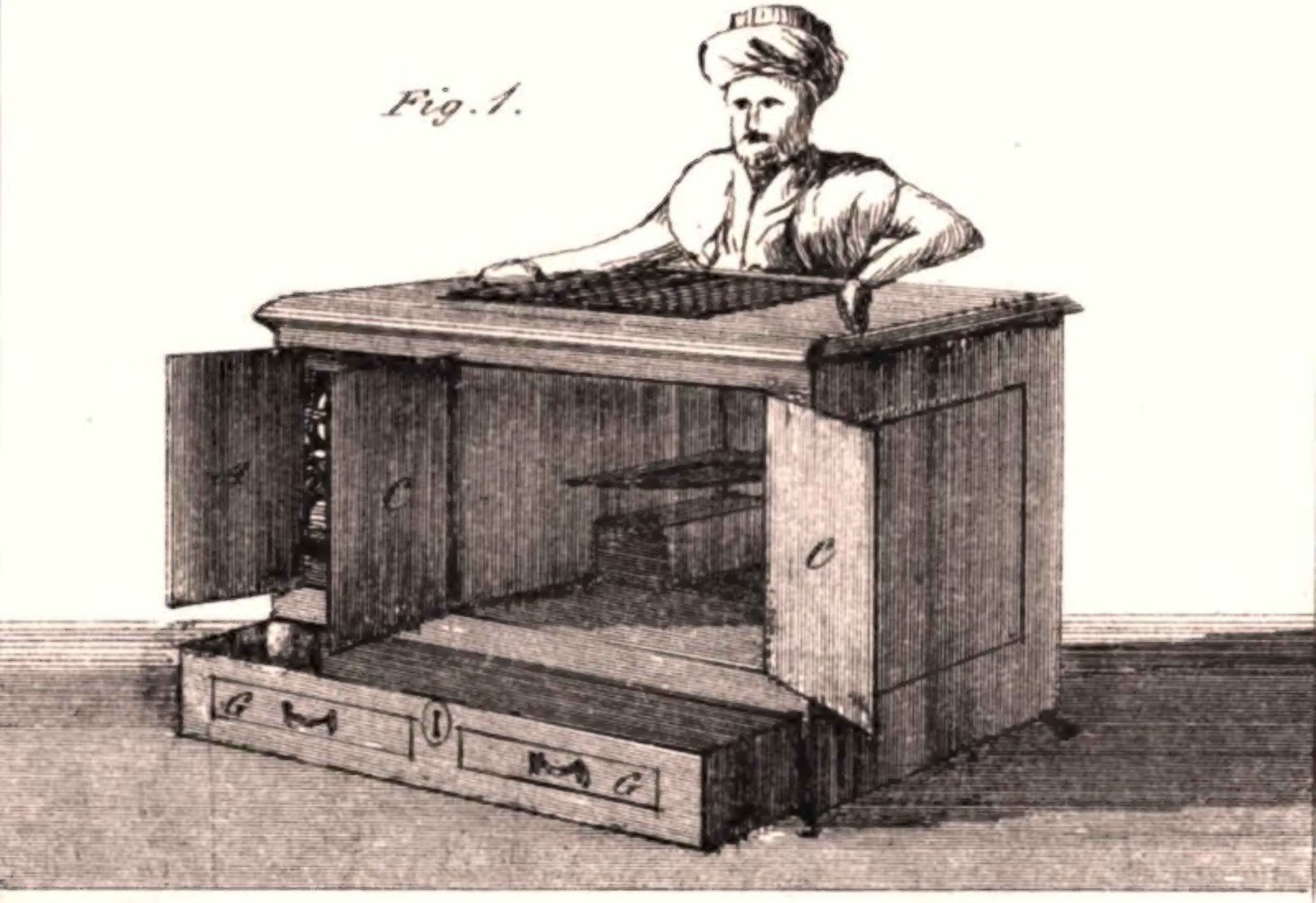
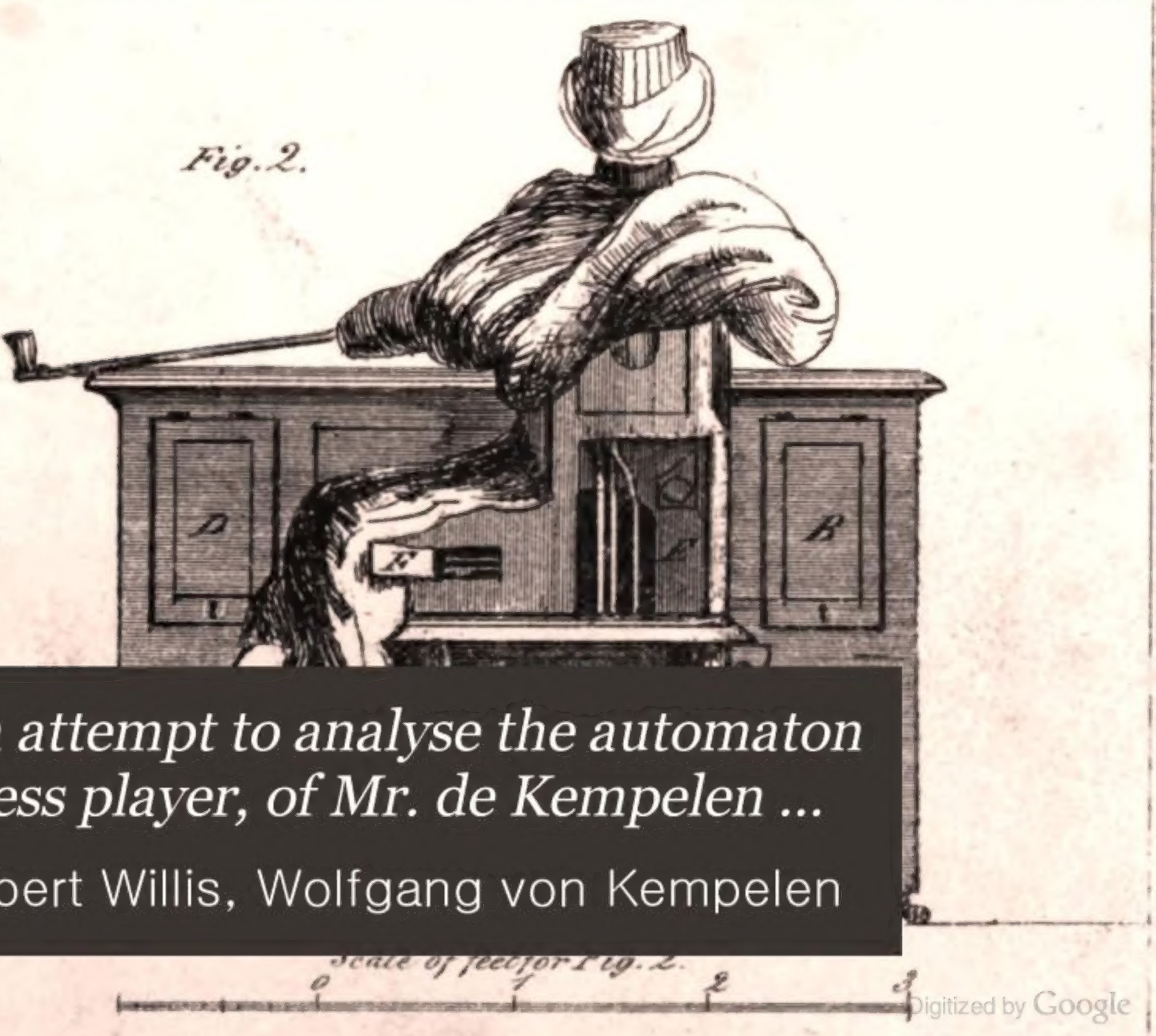


Fig. 2.


A
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An attempt to analyse the automaton chess player, of Mr. de Kempelen ...

Robert Willis, Wolfgang von Kempelen

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AN ATTEMPT TO ANALYSE
THE
AUTOMATON CHESS PLAYER.

Howlett and Brimmer,
Printers, 10, Frith Street, Soho.

Plate 1.

To face the Title.

Fig. 1.

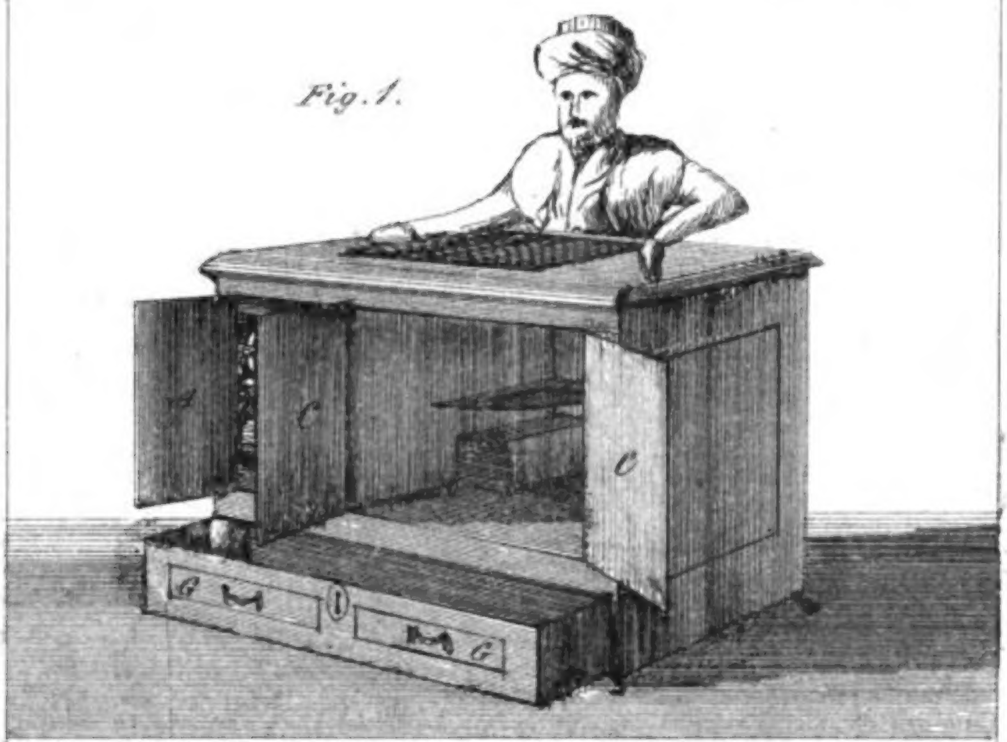
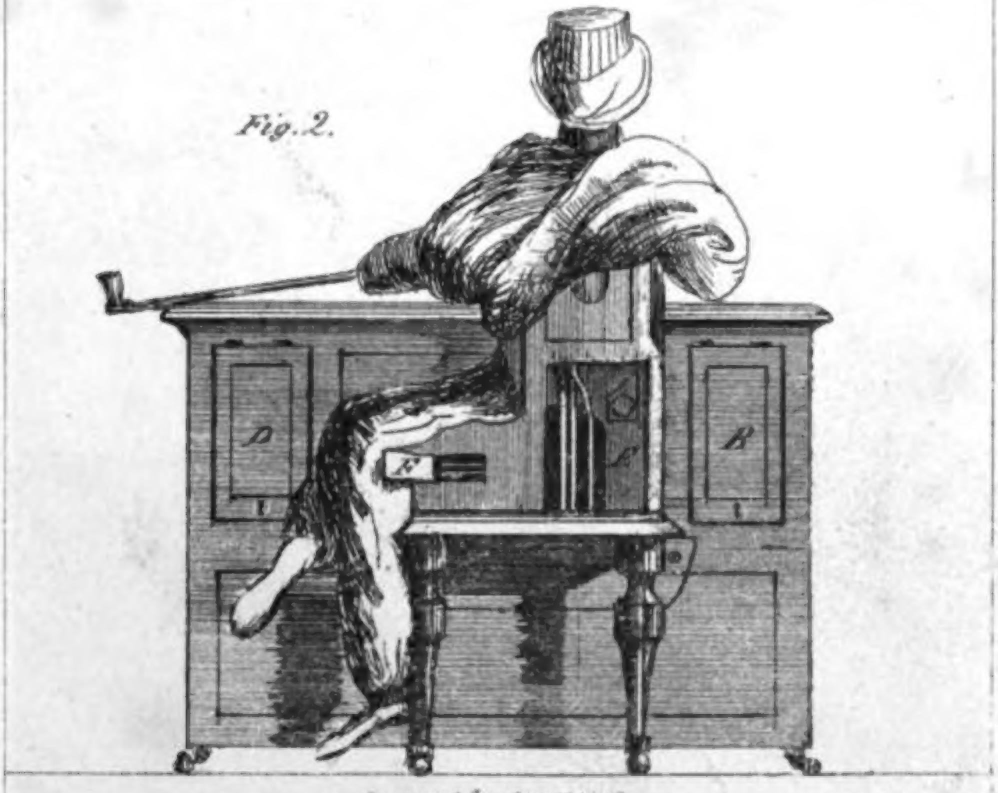


Fig. 2.


D
E'
F'
B
Scale of feet for Fig. 2.
0
1
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Drawn on Stone by the Author.

Printed by C. Hullmandel.

AN ATTEMPT TO ANALYSE

THE

AUTOMATON CHESS PLAYER,

OF

MR. DE KEMPELEN.

WITH AN EASY METHOD OF IMITATING THE MOVEMENTS OF THAT CELEBRATED FIGURE.

ILLUSTRATED BY ORIGINAL DRAWINGS.

TO WHICH IS ADDED, A COPIOUS COLLECTION OF
THE KNIGHT'S MOVES
OVER THE CHESS BOARD.

(R. Willis.)

LONDON:
PRINTED FOR J. BOOTH,
DUKE STREET, PORTLAND PLACE.
1821.

SG 3645.94

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NOVEMBER 8, 1938

Mine eyes are made the fools o' the other senses.
SHAKSPEARE.

I had not thought to have unlockt my lips
In this unhallowed air, but that this juggler
Would think to charm my judgment, as mine eyes.
MILTON.

AN ATTEMPT TO ANALYSE, &c.

THE Automaton Chess Player was first introduced into England by Mr. de Kempelen, its inventer, about the year 1783. It was brought again into this country two years ago, and exhibited under the direction of a very ingenious gentleman, Mr. Maelzel.

The annexed drawings, (plate 1, figs. 1 and 2,) represent the general appearance of the machine. It runs on castors, and is either seen on the floor when the doors of the apartment are thrown open, or is wheeled into the room at the commencement of the exhibition.

The exhibiter, in order to shew the mechanism, as he informs the spectators, unlocks the door (A, fig. 1.) of the chest, which exposes to view a small cupboard, lined with black or dark coloured cloth, and containing different pieces of machinery, which seem to occupy the whole space. He next opens the door (B, fig. 2.) at the back of the same cupboard, and, holding a lighted candle at the opening, still further exposes the machinery within. The candle being withdrawn, the door (B) is then locked. The drawer (G G, fig. 1.) in the front of the chest is next opened, and a set of chess men, a small box of counters, and a cushion for the support of the Automaton's arm, are taken out of it. The exhibiter now opens the two front doors (C C, fig. 1.) of the large cupboard, and the back door (D, fig. 2.) of the same, and applies a candle as in the former case. This cupboard is lined with cloth like the other, but it contains only a few pieces of machinery. The chest is now wheeled round, the garments of the figure are lifted up, and the door (E, fig. 2,) in the trunk, and another (F,) in the thigh, are opened. But it must be observed that the doors (B and D) are closed. The circumstance is mentioned, because Mr. de Windisch, in his letters on this subject, has a passage which would seem to imply that Mr. Maelzel's mode of exhibiting the interior differs from that which Mr. de Kempelen employed. "But do not imagine," says De Windisch, "like many others, that the inventer shuts one door as he opens another; the entire Automaton is seen at the same time uncovered, his garments turned up, and the drawer opened, as well as all the doors of the chest."

Now a reference to De Kempelen's second drawing, published by Mechel, and annexed to De Windisch's letters, will shew that, when the chest was turned round, the doors (B and D) were actually closed, as they always have been under the direction of Mr. Maelzel. In the chest of the latter gentleman, indeed, the doors in question are suspended by hinges attached to the upper part, (as in fig. 2), and consequently close by their own gravity. But the fact is, that the exhibiter never fails to lock them, though he leaves the keys in one of the locks. The other doors are allowed to swing about whilst the chest is wheeled round.

The chest is now restored to its former position on the floor; the doors in front, and the drawer, are closed and locked; and the exhibiter, after he has occupied some time at the back of the chest, in apparently adjusting the machinery, removes the pipe from the hand of the figure, winds up the works, and the Automaton begins to move.

These movements, resulting, as they appear to do, from mere mechanism, yet strongly impressed with the distinctive character of an intellectual guidance, have excited the admiration of the curious during a period little short of forty years. In that time various conjectures have been offered to the world as solutions of the problem; but no one, as far as I know, having attempted to imitate the movements, it is fair to conclude, either that the means proposed are inadequate to the end, or that the description of them is too imperfect to enable a workman to complete the machinery.

Automata may be divided into three classes—the simple—the compound—and the spurious.

The first class comprises those insulated Automata whose movements result from mechanism alone ; by the aid of which they perform certain actions, and continue them, so long as the moving force is kept in an active state.

The second class includes those Automata, which, like the former, are moved by machinery ; but, possessing at the same time a communication, not immediately apparent, with human agency, are enabled to change the regular order and succession of their movements, according to existing circumstances ; and hence, in some measure, to assume the character of living beings.

The third class contains those Automata which, under the semblance only of mechanism, are wholly directed and controlled by a concealed human agent.

The phenomena of the Chess Player are inconsistent with the effects of mere mechanism ; for, however great and surprising the powers of mechanism may be, the movements which spring from it, are necessarily limited and uniform : it cannot usurp and exercise the faculties of mind ; it cannot be made to vary its operations, so as to meet the ever-varying circumstances of a game of chess. This is the province of intellect alone ; and the Chess Player must consequently relinquish all claim to be admitted into the first division. Let us examine its title to be ranked in the second class.

The chess board contains sixty-four squares, and in order to execute the movements of the Chess Player, distinct trains of machinery must be formed, which shall be capable, when set in motion, of conveying the hand of the Automaton to each, and to any, of these several squares. Having arrived at a square, and taken up a chess man, it will be requisite, either to withdraw the hand towards the side, and without the limits of the board, for the purpose of letting drop the chess man there, and thence to proceed to another square, and remove a chess man to a third square; or it may be required to pass at once from the first square to any other on the board, and there to deposit the man. These movements must be promptly performed, and repeated as often as the circumstances of the game may call for them.

Setting aside a great variety of minor details, it will be evident to any person, even slightly acquainted with mechanics, that the execution of these movements, so extensive, so complicated, and so variable, would be attended with difficulties almost insurmountable; but we will suppose for a moment that these obstacles are overcome; let it be conceded that a machine has been constructed so perfect, that, on giving motion to the respective trains, the required movement shall be instantly performed. What then? The main object will be still unattained! Where is the intelligence and the "promethean heat" that can animate the Automaton and direct its operations? Not only must an intellectual agent be provided, but between such an agent and his deputy, the Automaton, a direct communication must be formed and preserved, liable to no interruption, and yet so secret that the penetrating eye of the most inquisitive observer may not be able to detect it. Till this be done, the Chess Player's title to be admitted into the second division will, at any rate, continue in abeyance.

I am aware that on this part of the

subject conjecture has been busy, and different plans have been devised for the maintenance of the intercourse alluded to. The task has been imposed on the exhibiter of the machine, he being the only person on whom it could devolve with even a shadow of probability; and to effect his purpose it has been suggested that he might touch certain springs, or pull "a wire not much thicker than a hair," or be furnished with a powerful magnet. But such conjectures are unworthy of serious refutation; for besides the uncertainty and constant liability to interruption of such modes of communication, they are actually at variance with the uniform conduct of the exhibiter. Whoever has witnessed the exhibition will have seen that the exhibiter is not confined to a particular spot in the room, but, on the contrary, that he is frequently, during the progress of the game, at a distance from the chest, far beyond the sphere of influence of any of these proposed modes; and if, at such times, the Automaton can move a single joint, it is proof decisive that its action springs from another source.

Having now shewn how difficult, and perhaps impossible, it would be to execute the movements of the Chess Player by mechanism, and maintain, at the same time, a communication with the agent, who would be required to give life, as it were, and intelligence to the operations, it becomes necessary to inquire whether the prevailing opinion, which attributes these movements to machinery, be, or be not, established in fact; for, if this opinion should be found, on examination, to originate merely in the artful management and display of some parts of the apparatus, and to rest on no solid basis, there would be no longer any embarrassment in appreciating the real value of the Chess Player, nor in apportioning a proper station for it, considered as a work of art.

At the commencement of the exhibition the spectators are gratuitously made acquainted with the interior of the chest, which is divided into two unequal compartments, and occupied by pieces of machinery, so arranged, as apparently to render the concealment of any human being impossible. When the movements of the Automaton begin, the beholders, in the first moments of surprise, and in the absence of any ostensible living cause, very naturally refer the effect to the mechanism, which has been exhibited; and with likelihood enough, for the movements immediately follow the familiar action and well known sound of winding up clockwork, and are moreover very skillfully accompanied by the grating noise of moving wheels. But, these indications excepted, where is the evidence that the machinery moves, or that the slightest influence is exerted by it on the arm of the Automaton? The whole is excluded from view, and a moment's reflection will convince any one that no stress can be laid on the winding up, nor on the accompanying sounds, which are imitable in various ways.

If, however, no proof can be given of the actual movement of the machinery, the following considerations will tend to shew that it remains quiescent, and is probably not formed for motion.

An artist, whose talents had enabled him to contrive machinery capable of executing the varied and extensive movements displayed by the Automaton, would surely be desirous of laying open to view as much of the mechanism of his contrivance, while in actual motion, as he could do, consistently with the reservation of his secret; if for no other reason, at least to convince the lookers-on that deception formed no part of his plan. Now it cannot be reasonably urged, in vindication of the inventer's forbearance, in the instance of the Chess Player, that even a glance at any part of the machinery in motion would betray the secret; for a question will immediately arise, Why then is the machinery at rest so freely exposed? On that score no apprehension seems to be entertained; the chest is ostentatiously opened, and the semblance, at least, of wheels, and pullies, and levers, is submitted to inspection without reserve: but when their reality should appear, and their connection with the Automaton be made manifest, the doors are carefully closed, and the spectators are required to pay large drafts on their credulity, without any means of further examination. The glaring contradiction between eager display on the one hand, and studied concealment on the other, can only be reconciled by considering the exhibition of the mechanism as a mere stratagem, calculated to distract the attention, and mislead the judgment, of the spectators.

The truth of this opinion receives additional support from the regular and undeviating mode of disclosing the interior of the chest. If the mechanism were the real object in view, the whole being quiescent, it would be matter of indifference which part was first laid open; and accident alone, unless powerful reasons operated against it, would lead occasionally to some variation. But no variation has ever been observed to take place. One uniform order, or routine, is strictly adhered to, and this circumstance alone is sufficient to awaken suspicion, for it shews plainly that more is intended by the disclosure than is permitted to meet the eye.

It has already been suggested, that little stress could be laid on the winding up: indeed the simple act of turning round a key or winder can offer no argument in proof of the efficiency of the machinery, unless at the same time it could be shewn that the key, in turning, either acted upon a spring, or pulled up a weight, for the purpose of giving motion to the machinery in question. But unluckily for the Chess Player, the phenomena afford positive proof that the axis turned by the key is quite free, and unconnected, either with a spring, or a weight, or any system of machinery.

In all machines requiring to be wound up, two consequences are inseparable from their construction: the first is, that, in winding up the machinery, the key is limited in the number of its revolutions; and the second is, that some relative proportion must be constantly maintained betwixt the winding up and the work performed, in order to enable the machine to continue its movements. Now these results are not observable in the Chess Player; for the Automaton will sometimes execute sixty-three moves with only one winding up; at other times the exhibiter has been observed to repeat the winding up after seven moves, and even three moves; and once, probably from inadvertence, without the intervention of a single move; whilst, in every instance, and the circumstance, though trifling, calls for particular attention, (for, in these matters, be it remembered, " trifles light as air, are confirmations strong,") the key appeared to perform the same number of revolutions; evincing thereby, that the revolving axis was unconnected with machinery, except, perhaps, a ratchet-wheel and click, or some similar apparatus, to enable it to produce the necessary sounds, and consequently that the key, like that of a child's watch, might be turned, whenever the purposes of the exhibition seemed to require it.

I shall now pass on to the third division, and point out a method by which any person, well skilled in the game, and not exceeding the ordinary bulk or stature, may secretly animate the Automaton, and successfully imitate the movements of Mr. De Kempelen's Chess Player.

The general plan and dimensions of the chest will be understood by inspecting the plates, but some particulars, relative to the interior, will require further explanation.

The drawer (GG, plate 5,) when closed, does not reach to the back of the chest; it leaves a space (o) behind it, about 1 foot 2 inches broad, 8 inches high, and 3 feet 11 inches long. This space is never exposed to view.

The small cupboard is divided into two parts by the door or screen (I, fig. 6,) which is moveable on a hinge, and is so contrived that when B is closed, this screen may be closed also. The machinery (H) occupies the whole of the front division as far as I; the hinder division is nearly empty, and communicates with the space behind the drawer, the floor of this division being removed.

The back of the great cupboard is double, and the part (P Q,) to which the quadrants, &c. are attached, moves on a joint (Q), at the upper part, and forms, when raised, an opening (S) between the two cupboards, by carrying with it part of the partition (R), which is composed of cloth stretched tight. Fig. 10 shews the false back closed. Fig. 11 shews the same raised, forming the opening (S) between the chambers.

When the trunk of the figure is exposed by lifting up the dress, it will be seen that a great part of it is occupied by an inner trunk (N), which passes off towards the back in the form of an arch, (fig. 2), and conceals a portion of the interior from the view of the spectators. This inner trunk opens to the chest by an aperture (T, fig. 9), about 1 foot 3 inches high, by 1 foot broad.

When the false back is raised, the two chambers, the trunk, and the space behind the drawer, are all connected together.

The player may be introduced into the chest through the sliding panel (U, fig. 6), at the end. He will then elevate the false back of the large cupboard, and assume the position represented by the dotted lines in figs. 3 and 4. Every thing being thus prepared, "the charm's wound up," and the exhibiter may begin his operations by opening the door (A). From the crowded and very ingenious disposition of the machinery in this cupboard, the eye is unable to penetrate far beyond the opening, and the spectator is led to conclude that the whole space is occupied with a similar apparatus. This illusion is strengthened and confirmed by observing the glimmering light which plays among the intricacies of the machinery, and occasionally meets the eye, when the lighted candle is held at the door (B). A fact, too, is ascertained, which is equally satisfactory, though indeed for opposite reasons, to the spectator and the exhibiter, viz. that no opake body of any magnitude is interposed between the light and the spectator's eye. The door (B) must now be locked, and the screen (I) closed, which being done at the moment the light is withdrawn, will wholly escape observation.

It has already been mentioned, that the door (B), from its construction, closes by its own weight; but as the player's head will presently be very near it, the secret would be endangered, if, in turning round the chest, this door were, by any accident, to fly open; it becomes necessary, therefore, "to make assurance double sure," and turn the key. If the circumstance should be observed, it will probably be considered as accidental, the keys being immediately wanted for the other locks.

The opening (B) being once secured, and the screen (I) closed, the success of the experiment may be deemed complete. The secret is no longer exposed to hazard; and the exhibiter is at liberty to shape his conduct in any way, he may think, most likely to secure the confidence of the spectators, and lead them insensibly from the main object of pursuit. The door (A) may be safely left open; and this will tend to confirm the opinion, which the spectators probably formed on viewing the candle through this cupboard, that no person was concealed within it: it will further assure them that nothing can pass in the interior without their knowledge, so long as this door continues open.

The drawer stands next in the order of succession: it is opened, *apparently*, for the purpose of taking out the chess men, cushion, &c. but *really* to allow time for the player to change his position, (see fig. 5.) and to replace the false back and the partition, preparatory to the opening of the great cupboard.

The machinery is so thinly scattered over this cupboard, that the eye surveys the whole space at one glance, and it might seem unnecessary to open a door at the back, and to hold a lighted candle there, as in the former instance; but the artifice is dictated by sound policy, which teaches that the exhibiter cannot be too assiduous in affording facilities to explore every corner and recess, which, he well knows, contain nothing that he is desirous of concealing.

The chest may now be wheeled round for the purpose of shewing the trunk of the figure; leaving, however, the front doors of the great chamber open. The bunch of keys, too, should be suffered to remain in the door (D); for the apparent carelessness of such a proceeding will serve to allay any suspicion, which the circumstance of locking the door (B) might have excited, more especially as the two doors resemble one another in point of construction.

When the drapery has been lifted up,

and the doors in the trunk and thigh opened, the chest may be returned to its former situation, and the doors be closed. In the mean-time the player should withdraw his legs from behind the drawer, as he will not so easily effect this movement after the drawer has been pushed in.

Here let us pause awhile, and compare the real state of the chest at this time, with the impression which, at a similar period of an exhibition of the Chess Player, has generally been left on the minds of the spectators; the bulk of whom have concluded that each part of the chest had been successively exposed; and that the whole was at that time open to inspection: whereas, on the contrary, it is evident that some parts had been entirely withheld from view, others but obscurely shewn, and that nearly half of the chest was then excluded from their sight. Hence we learn how easily, in matters of this sort, the judgment may be led astray by an artful combination of circumstances, each assisting the other towards the attainment of one object.

When the doors in front have been closed, the exhibiter may occupy as much time, as he finds necessary, in apparently adjusting the machinery at the back, whilst the player is taking the position described in figs. 7 and 8. In this position he will find no difficulty in executing every movement required of the Automaton: his head being above the table, he will see the chess-board through the waistcoat, as easily as through a veil; and his left hand extending beyond the elbow of the figure, he will be enabled to guide its hand to any part of the board, and to take up and let go a chess man with no other " delicate mechanism" than a string communicating with the fingers. His right hand being within the chest, may serve to keep in motion the contrivance for producing the noise, which is heard during the moves, and to perform the other tricks of moving the head, tapping on the chest, &c.

In order to facilitate the introduction of the player's left arm into the arm of the figure, the elbow of the latter is obliged to be drawn backwards; and to account for, and conceal, this strained attitude, a pipe is ingeniously placed in the Automaton's hand. This pipe must not be removed till the other arrangements are completed.

When all is ready, and the pipe removed, the exhibiter may turn round the winder, or key, to give the impression to the spectators of winding up a spring, or weight, and to serve as a signal to the player to set the head of the Automaton in motion.

The above process is simple, feasible, and effective; shewing indisputably that the phenomena may be produced without the aid of machinery, and thereby rendering it probable that the Chess Player belongs in reality to the third class of Automata, and derives its merit solely from the very ingenious mode by which the concealment of a living agent is effected.

In conducting this analysis, the author disclaims even the slightest wish or intention to depreciate, or detract from, the real merits of Mr. De Kempelen: those merits have long since received the stamp of public approbation; indeed, a more than ordinary share of skill and ingenuity must have fallen to his lot, who could imagine and execute a machine (it matters not by what means the phenomena are brought about) which has never failed to delight the spectators, by exciting and maintaining, above all other contrivances of the kind, that pleasing delusion in the mind, which the Roman poet has so happily denominated "*Mentis gratissimus error.*"

December, 1820.

EXPLANATION OF THE PLATES.

PLATE I.

Fig. 1.	A perspective view of the Automaton, seen in front, with all the doors thrown open.
Fig. 2.	An elevation of the back of the Automaton.

PLATE II.

Fig. 3.	An elevation of the front of the chest, the dotted lines representing the player in the first position.
Fig. 4.	A side elevation, shewing the player in the same position.

PLATE III.

Fig. 5.	A front elevation, shewing the second position.
Fig. 6.	An horizontal section through the line WW. fig. 5.

PLATE IV.

Fig. 7.	A front elevation, shewing the third position.
Fig. 8.	A side elevation of the same position.

PLATE V.

Fig. 9.	A vertical section through the line XX, fig. 8.
Fig. 10.	A vertical section through the line YY, fig. 7, shewing the false back closed.
Fig. 11.	A similar section, shewing the false back raised.

THE FOLLOWING LETTERS OF REFERENCE ARE EMPLOYED IN ALL THE PLATES.

A	Front door of the small cupboard.
B	Back door of ditto.
CC	Front doors of the large cupboard.
D	Back door of ditto
E	Door in the trunk
F	Door in the thigh.
GG	The drawer.
H	Machinery in front of the small cupboard.
I	Screen behind the machinery.
K	Opening caused by the removal of part of the floor of the small cupboard.
L	A box which serves to conceal an opening in the floor of the large cupboard, made to facilitate the first position; and which also serves as a seat for the player in the third position.
M	A similar box to receive the toes of the player in the first position.
N	The inner chest, filling up part of the trunk.
O	The space behind the drawer.
PQ	The false back, turning on a joint at Q.
R	Part of the partition formed of cloth stretched tight, which is carried up by the false back, to form the opening between the chambers.
S	The opening between the chambers.
T	The opening connecting the trunk and chest, which is partly concealed by the false back.
U	Panel which is slipped aside to admit the player.

APPENDIX.

THE Knight's move over the chess board has engaged the attention of so many scientific men, that I cannot doubt that a collection of different solutions of the problem will prove acceptable to all admirers of chess.

The Knight's path is of two kinds—terminable and interminable—it is interminable, whenever the last, or concluding, move of a series be made on a square, which lies within the Knight's reach of that from which he originally set out—and terminable in every other instance.

Euler published a paper in the Memoirs of the Academy of Berlin, 1759, which contains a method of filling up all the squares, setting out from one of the corners. It also contains an endless or interminable route; and explains a principle by which these routes may be varied so as to end upon any square. Montmort, Demoivre, and Mairan, have severally given solutions of the same problem. These solutions will be found in the following collection.

Observing that the Automaton, under the direction of Mr. Maelzel, occasionally traversed half the board, I was induced to pursue the subject, and I found that the move might be performed on any *parallelogram* consisting of *twelve* squares and upwards, with the exception of *fifteen* and *eighteen* squares. The *whole* board admits of a great variety both in the terminable and interminable routes.

In describing the Knight's path, I have preferred lines to figures; the former giving a clearer idea of the plan pursued, and affording a greater facility of comparing one route with another, than the latter.

DIRECTIONS FOR PLACING THE PLATES.

Plate 1 *to face the Title.*
Plates 2 *to* 5 — *Page* 36.
—— 6 *to* 10 ——— 38.

Plate 2.

Fig. 3.

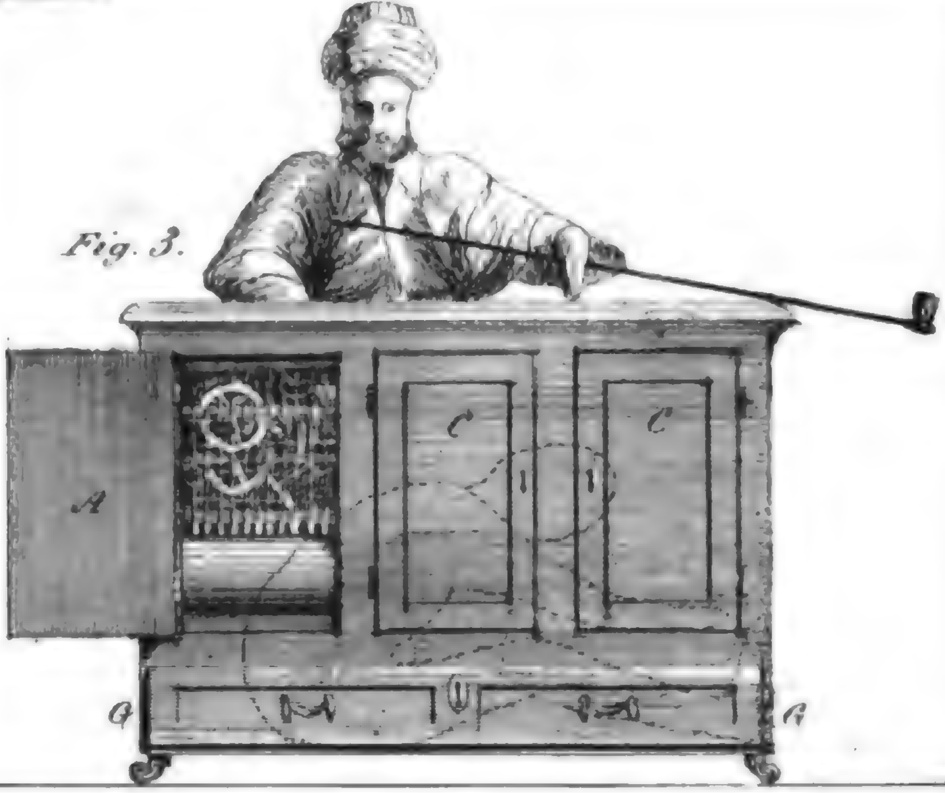
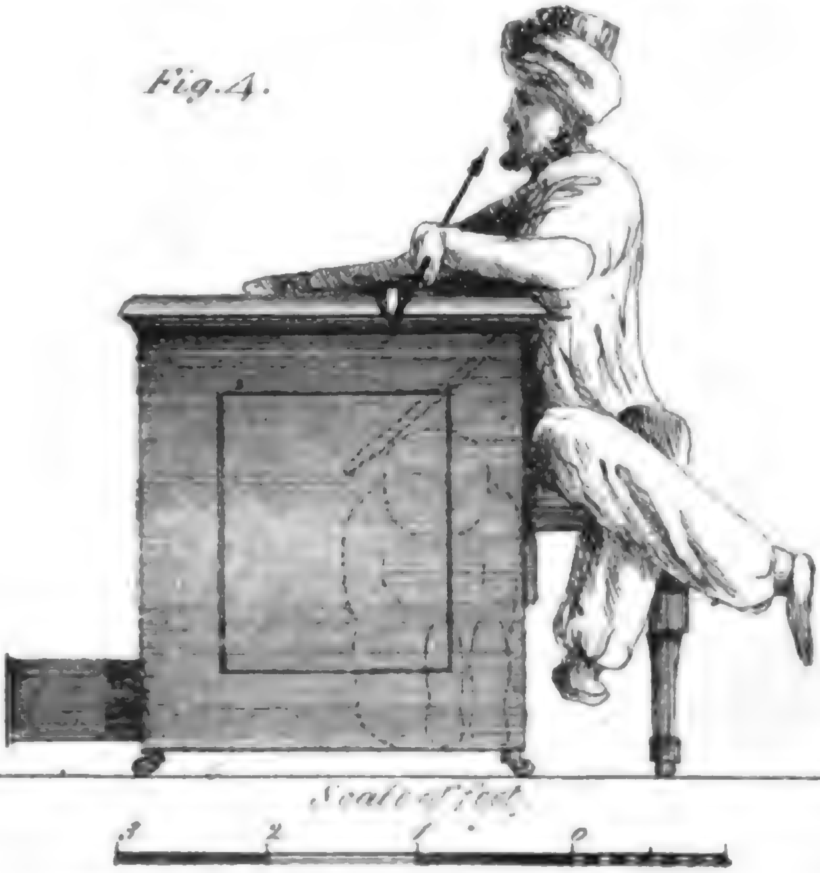


Fig. 4.



Drawn on Stone by the Author.
Printed by C. Hullmandel

Plate 3.

Fig. 5.

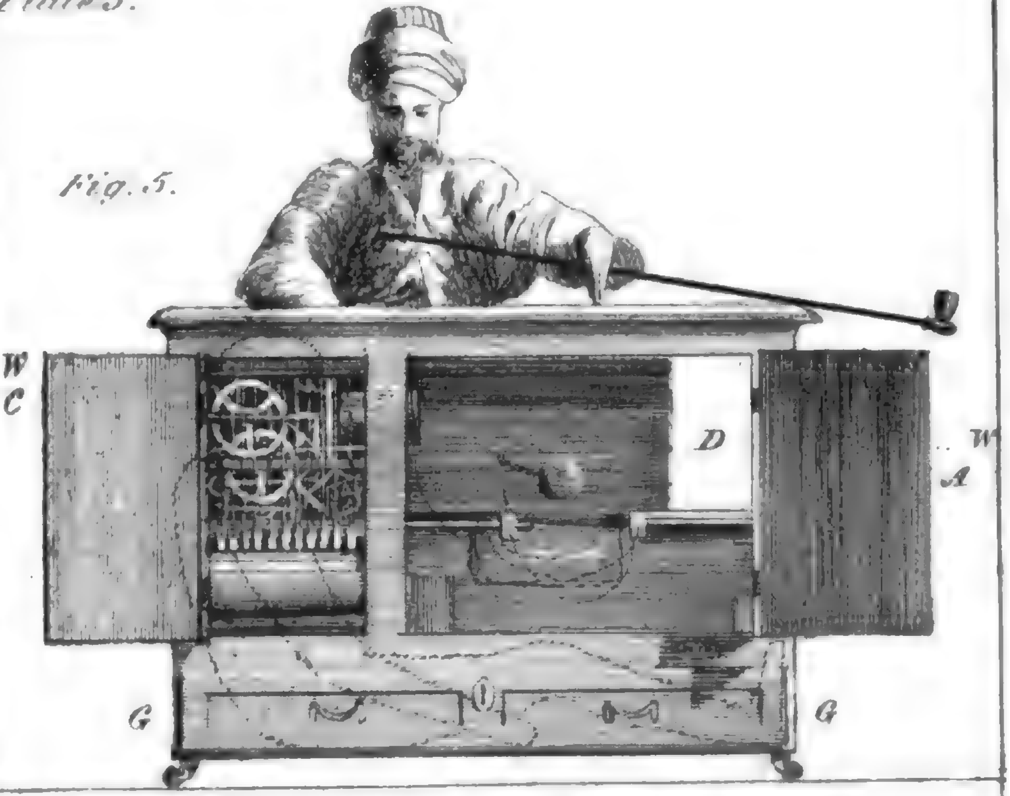
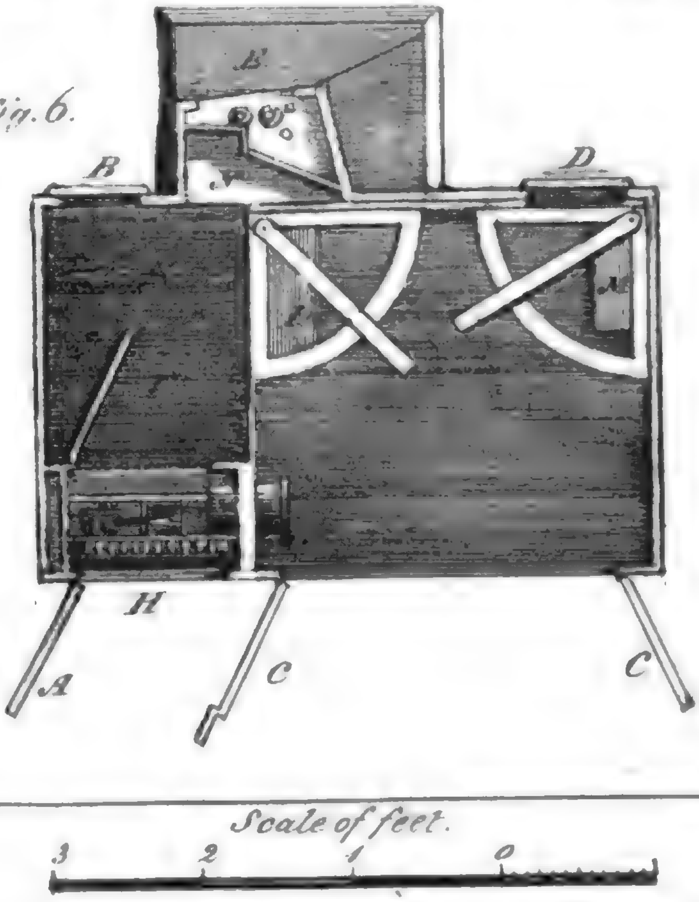


Fig. 6.



Drawn on Stone by the Author.

Printed by C. Hullmandel.

Plate 4.

Fig. 7

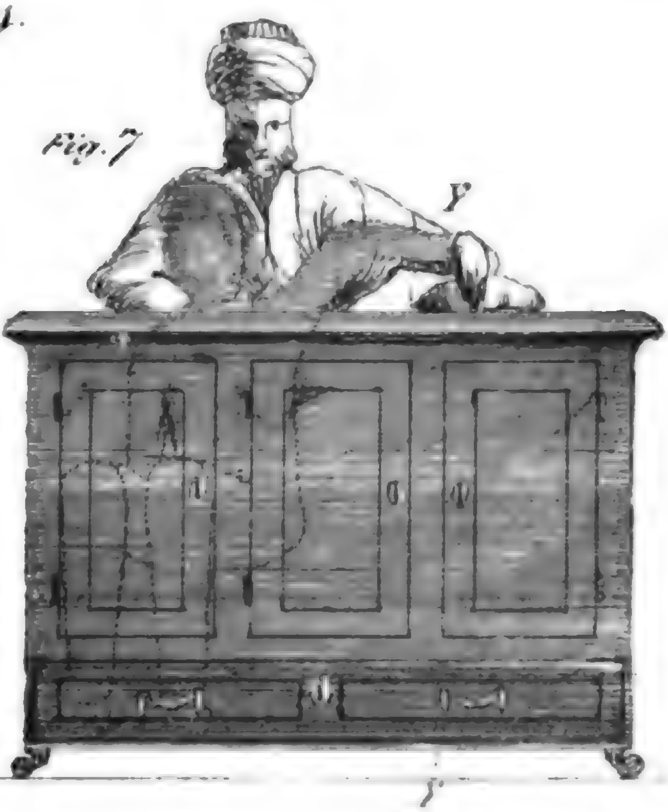


Fig. 8.

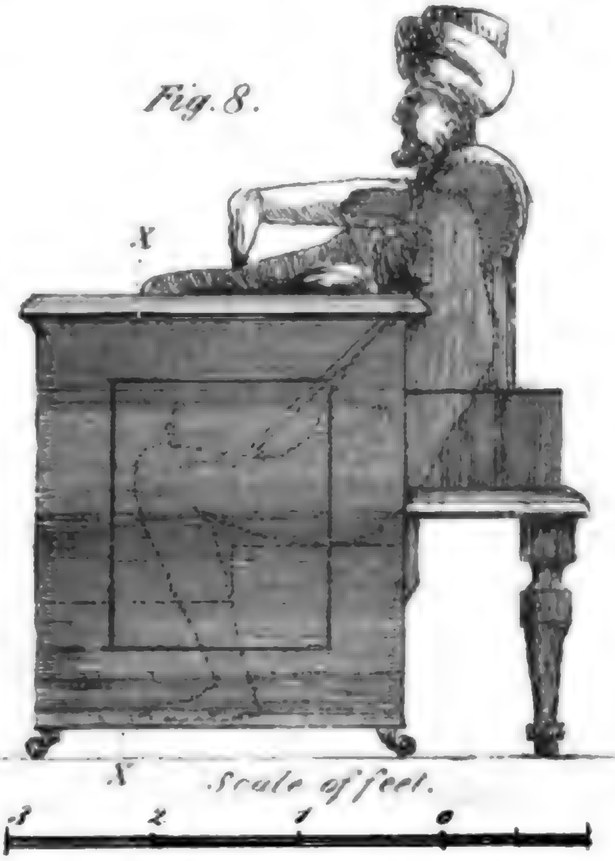


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Plate 5.

Fig. 9

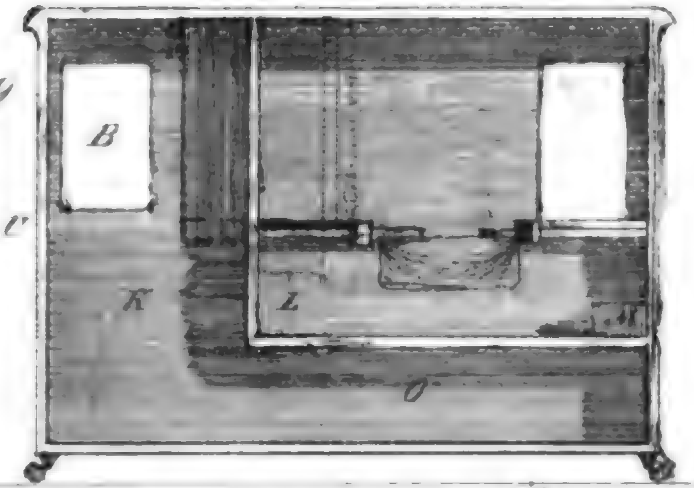


Fig. 10.

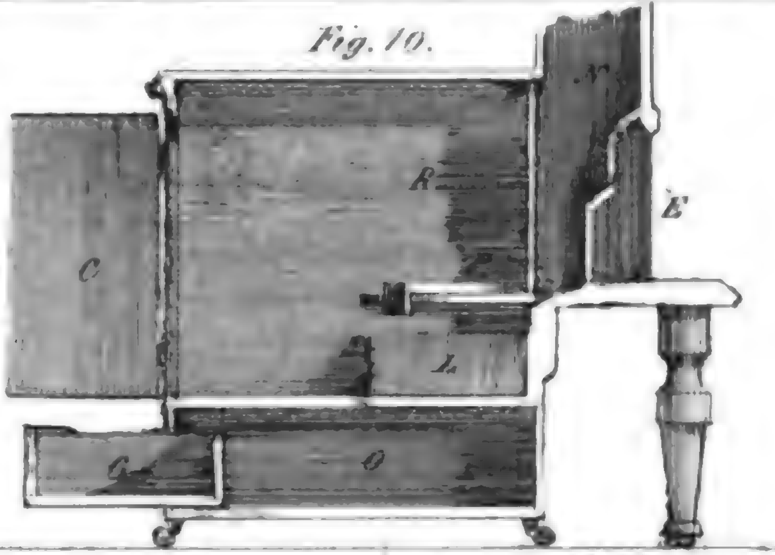
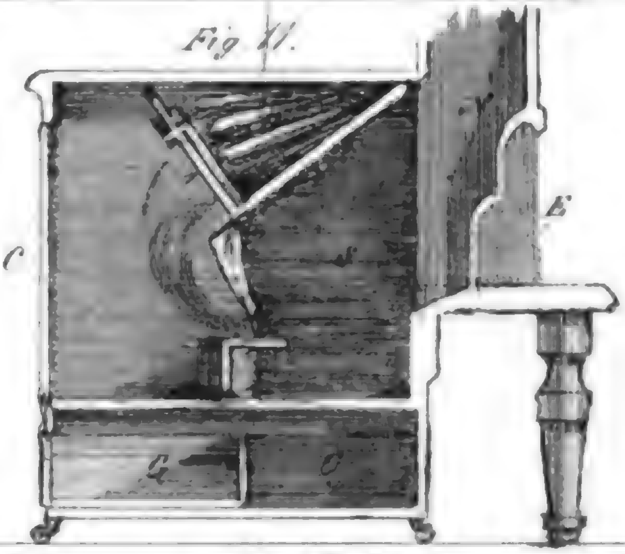


Fig. 11.

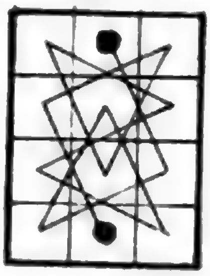


Scale of feet

Drawn on Stone by the Author. Printed by C. Hullmandel.

Plate. 6.

N°1



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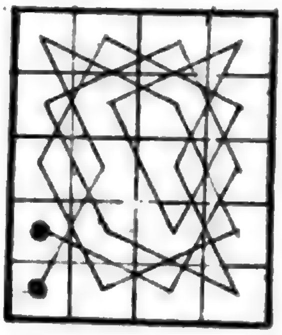

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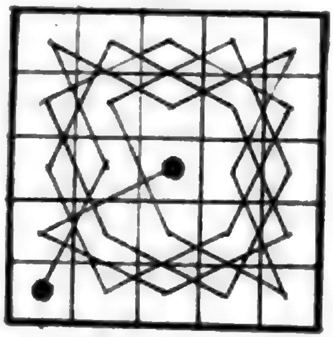

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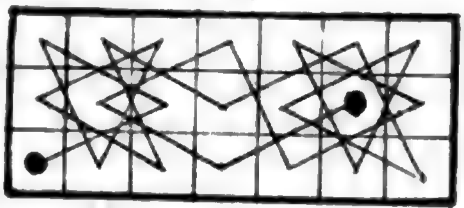

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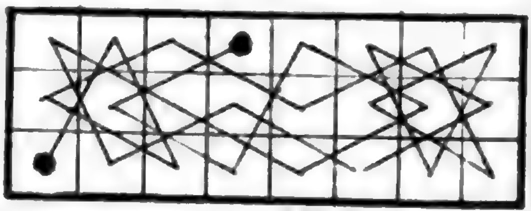

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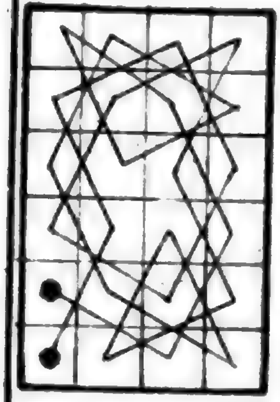

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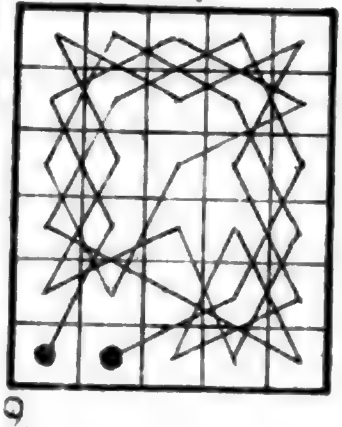

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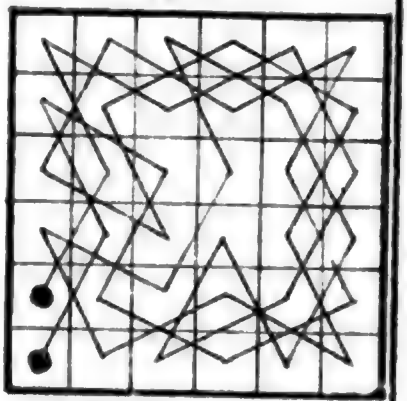

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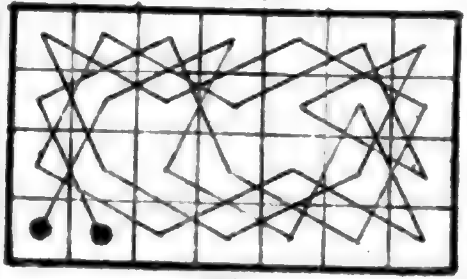

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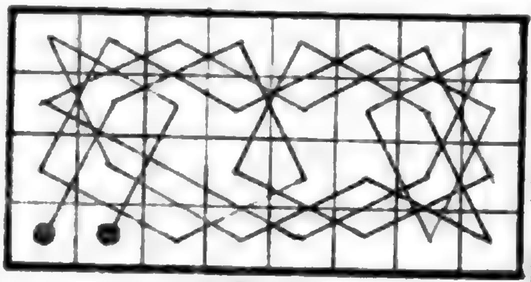

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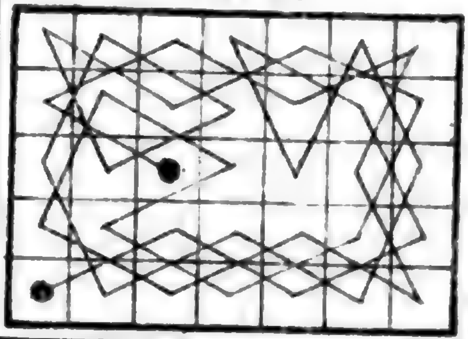

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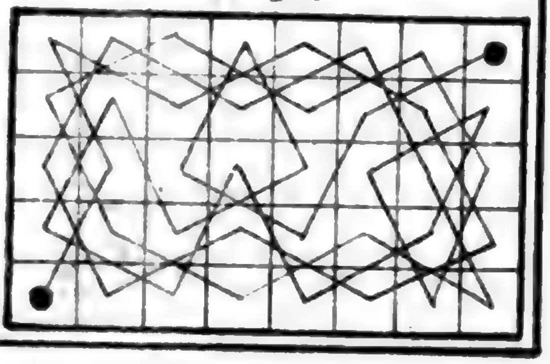
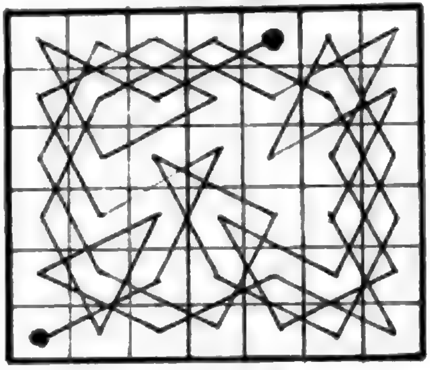


Plate 7.

N° 13



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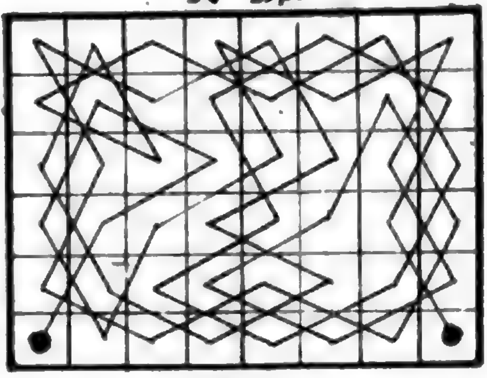

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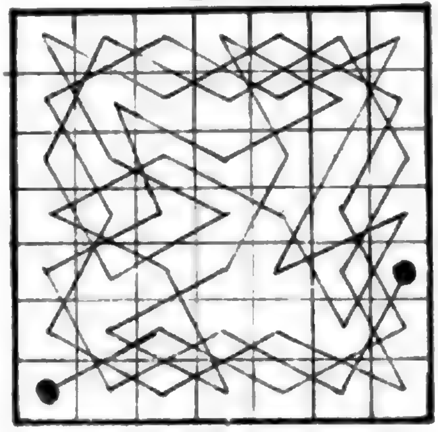

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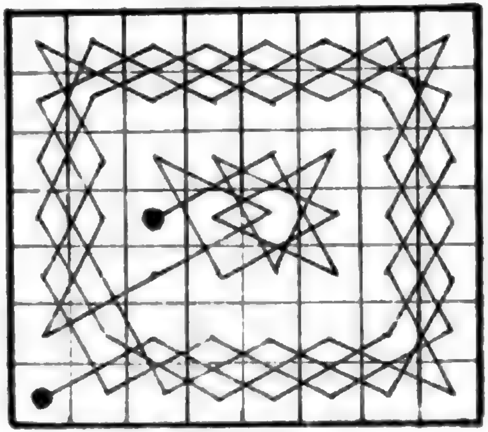

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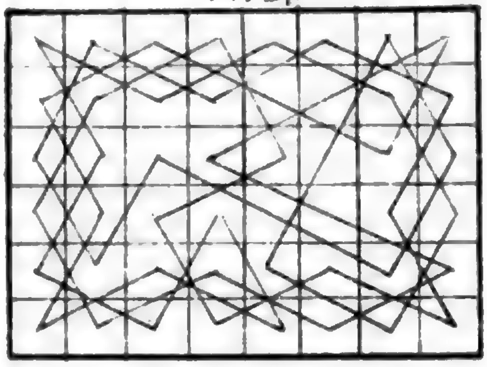

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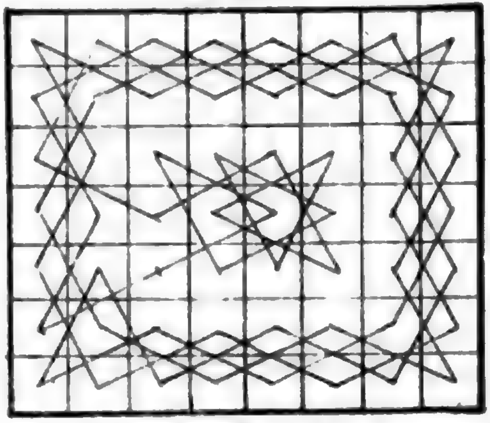

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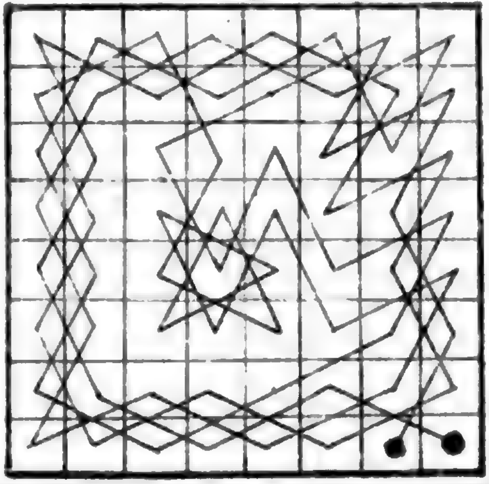

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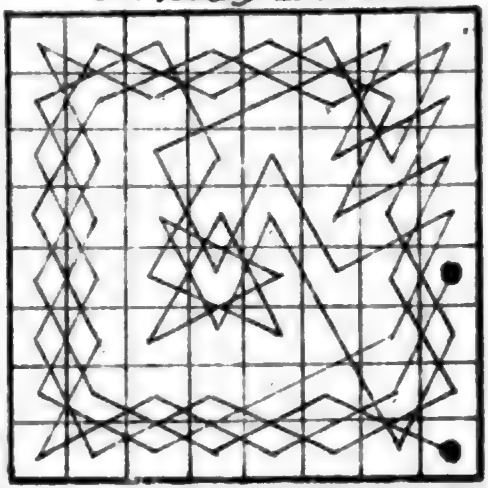
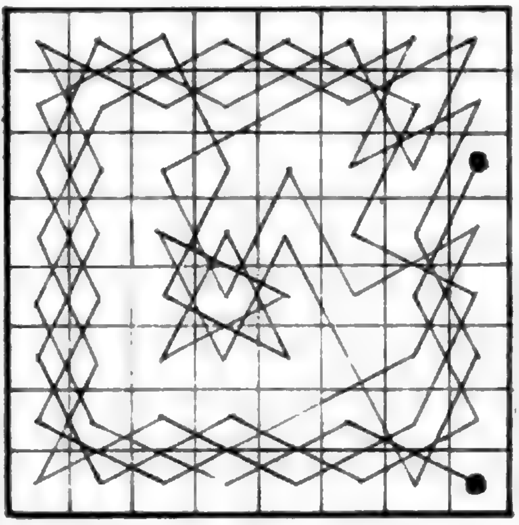
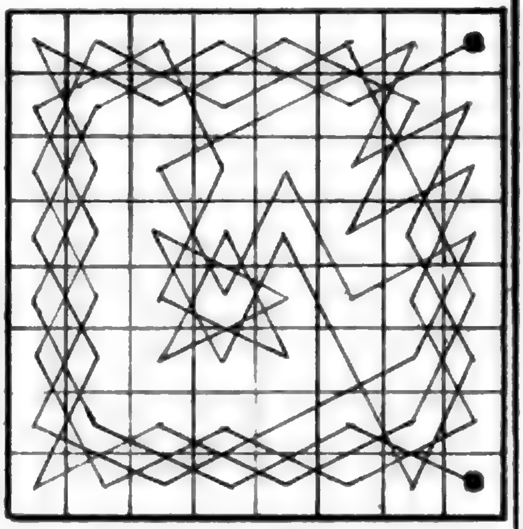


Plate 8.

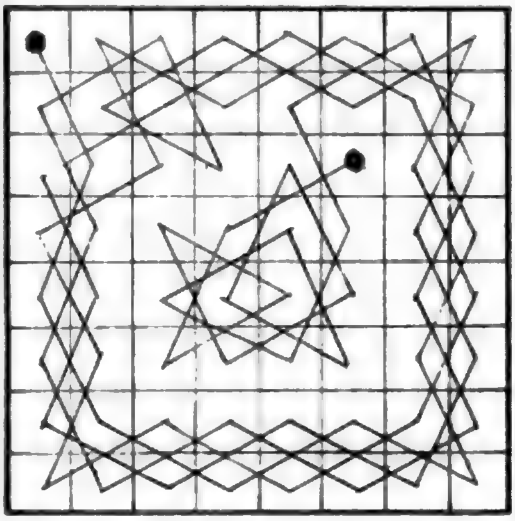
N°. 22 By Euler.



N°. 23. By Euler.



N° 24. By Demoivre.



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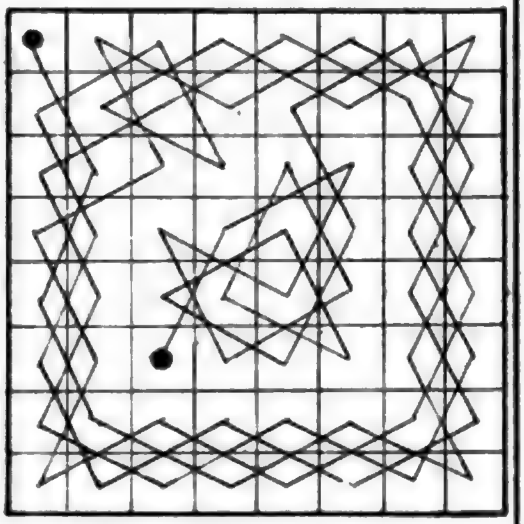
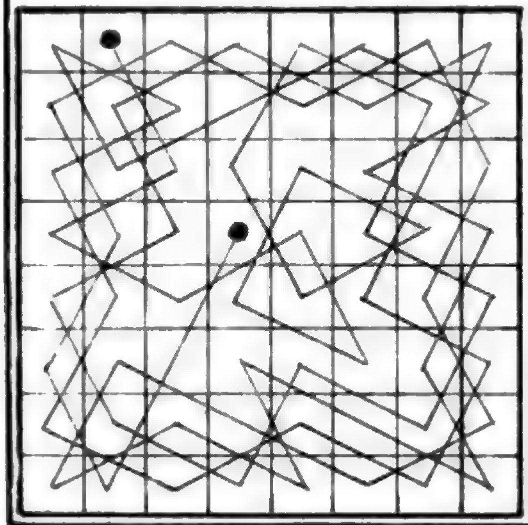


N°. 26. By Mairan.



N°. 27. By Montmort.

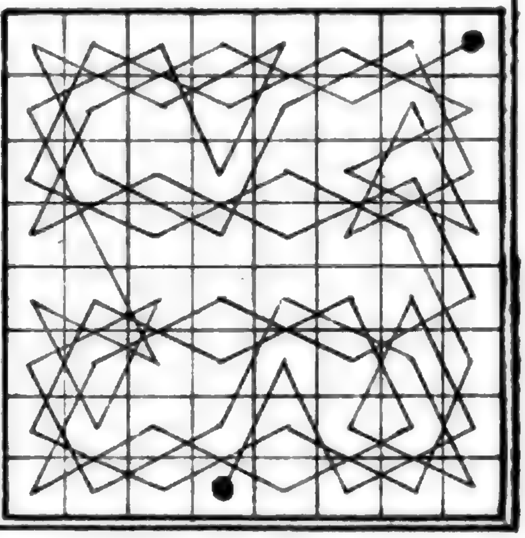
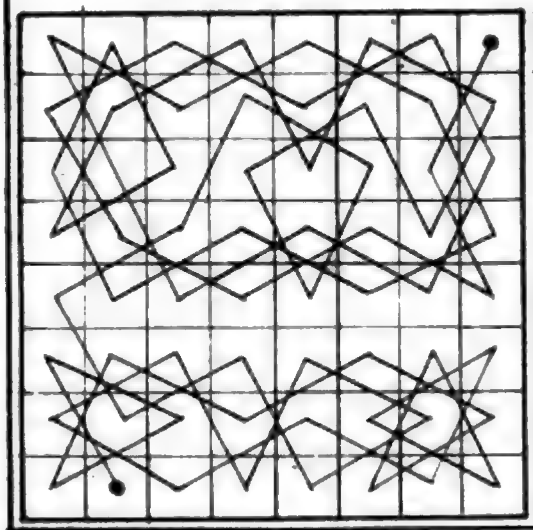


Plate 9.

N°. 28.



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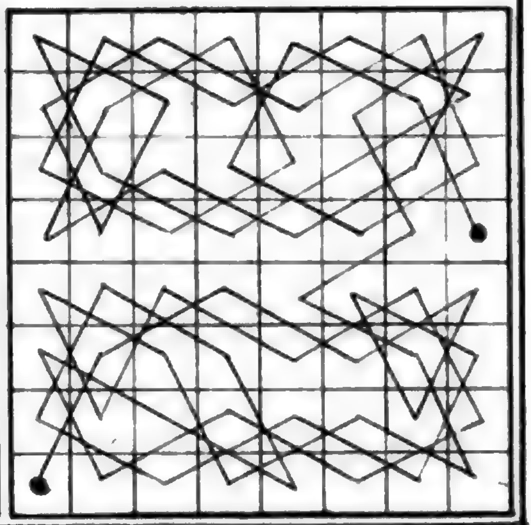
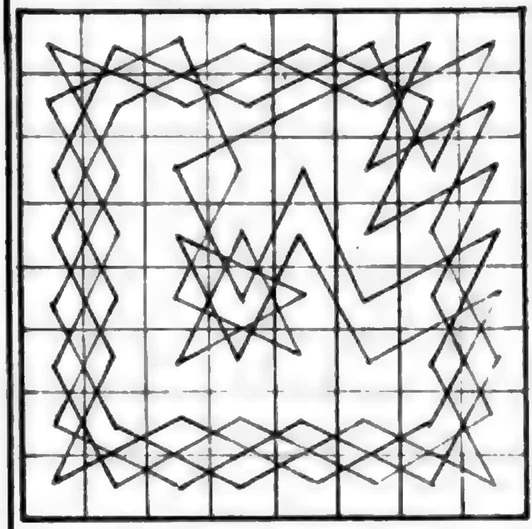
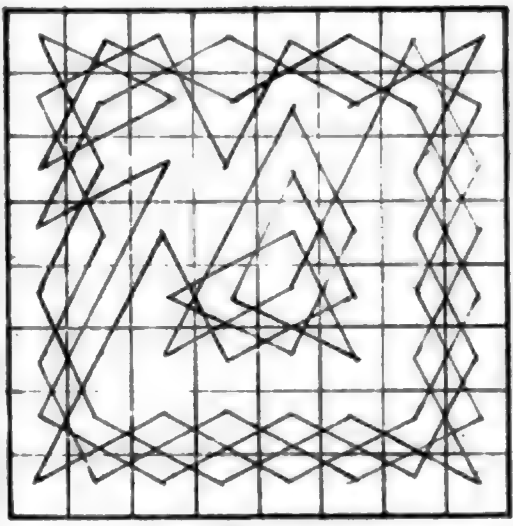


N°. 30. *By Euler.*



N°. 31. *By M. W....*



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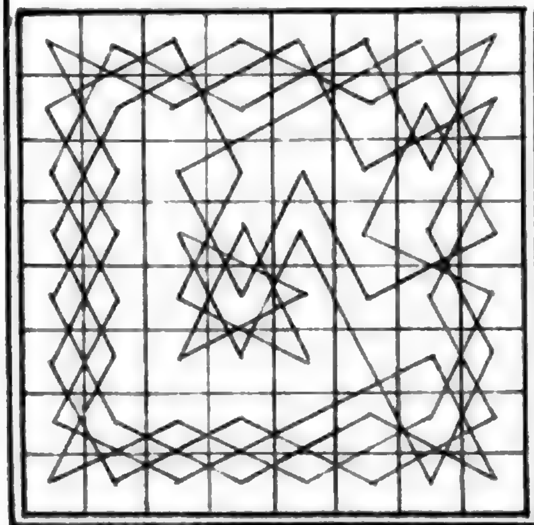

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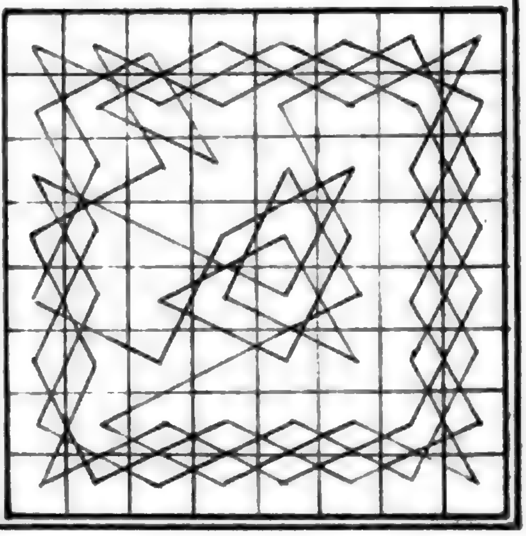
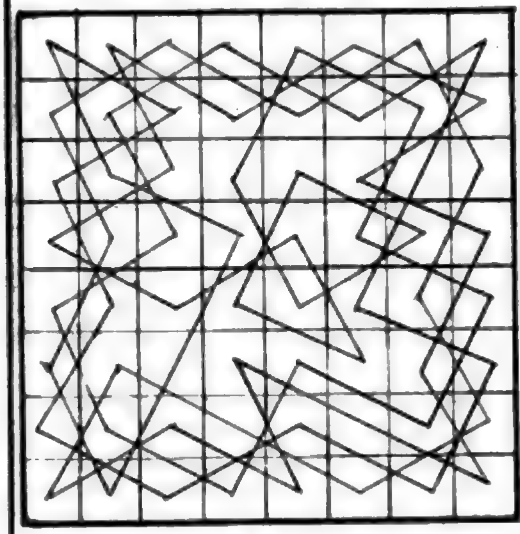


Plate 10.

Nº. 34.



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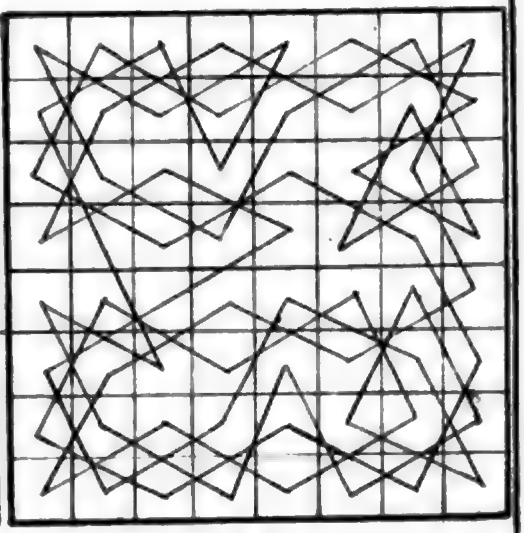

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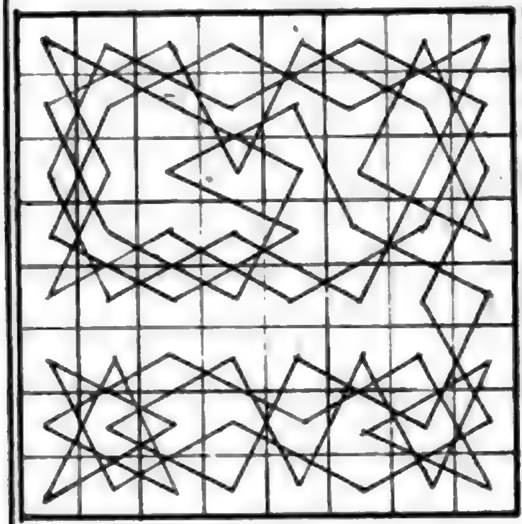

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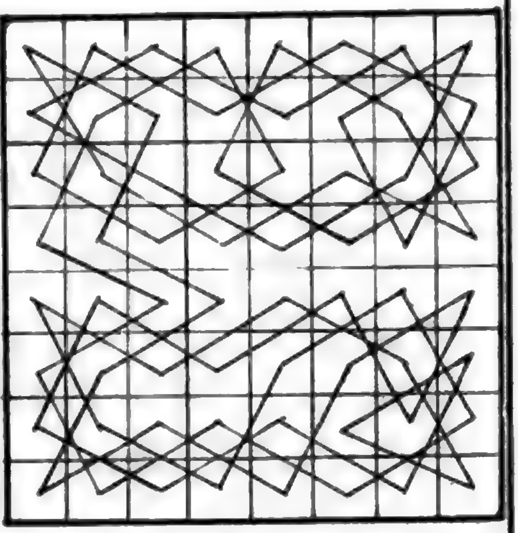

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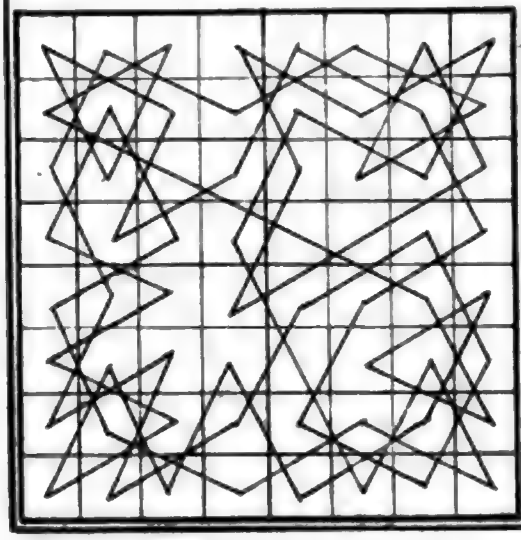

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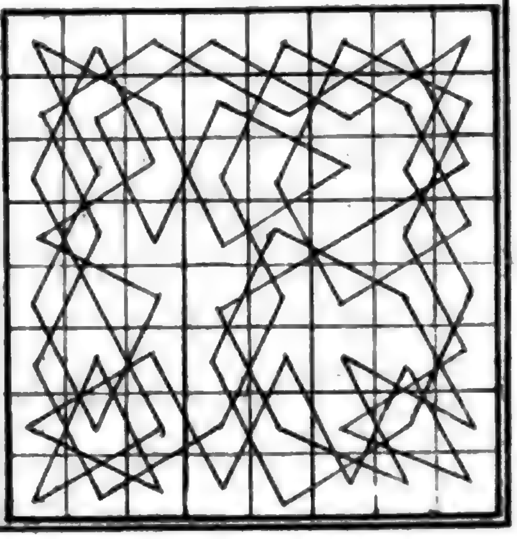

LIST OF THE KNIGHT'S MOVES

Contained in Plates 6, 7, 8, 9, and 10.

Methods of performing the Move on Parallelograms less than the whole Board.

No. 1 the Move on 12 Squares
— 2 - - - - - - 20 - - -
— 3 - - - - - - 25 - - -
— 4 - - - - - - 21 - - -
— 5 - - - - - - 24 - - -
— 6 - - - - - - 24 - - -
— 7 - - - - - - 30 - - -
— 8 - - - - - - 36 - - -
— 9 - - - - - - 28 - - -
— 10 - - - - - - 32 - - -

No. 11 the Move on 35 Squares
— 12 - - - - - - 40 - - -
— 13 - - - - - - 42 - - -
— 14 - - - - - - 48 - - -
— 15 - - - - - - 49 - - -
— 16 - - - - - - 56 - - -
— 17 an Interminable Route on 48 Squares
— 18 Do. Do. 56 - - -

Terminable Routes over the whole Board.

No. 20 By Euler
— 21 - Do.
— 22 - Do.
— 23 - Do.

No. 24 By Demoivre
— 25 - Do.
— 26 - Mairan
— 27 - Montmort

No. 28 By the Author
— 29 - Do.

Interminable Routes over the whole Board.

No. 30 By Euler
— 31 - Mons. W.
— 32 - the Author
— 33 - Do.

No. 34 By the Author
— 35 - Do.
— 36 - Do.
— 37 - Do.

No. 38 By the Author
— 39 - Do.

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